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**Wolgast**

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(54) **SEAT RAIL ADAPTER COMPRISING TWO MOUNTING PARTS, SEAT RAIL AND CABIN ARRANGEMENT COMPRISING SUCH A SEAT RAIL ADAPTER**

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**B60N 2/015** (2006.01)  
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CPC ..... **B60N 2/0715** (2013.01); **B60N 2/01516** (2013.01); **B60N 2/0722** (2013.01); **B64D 11/0696** (2013.01)

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See application file for complete search history.

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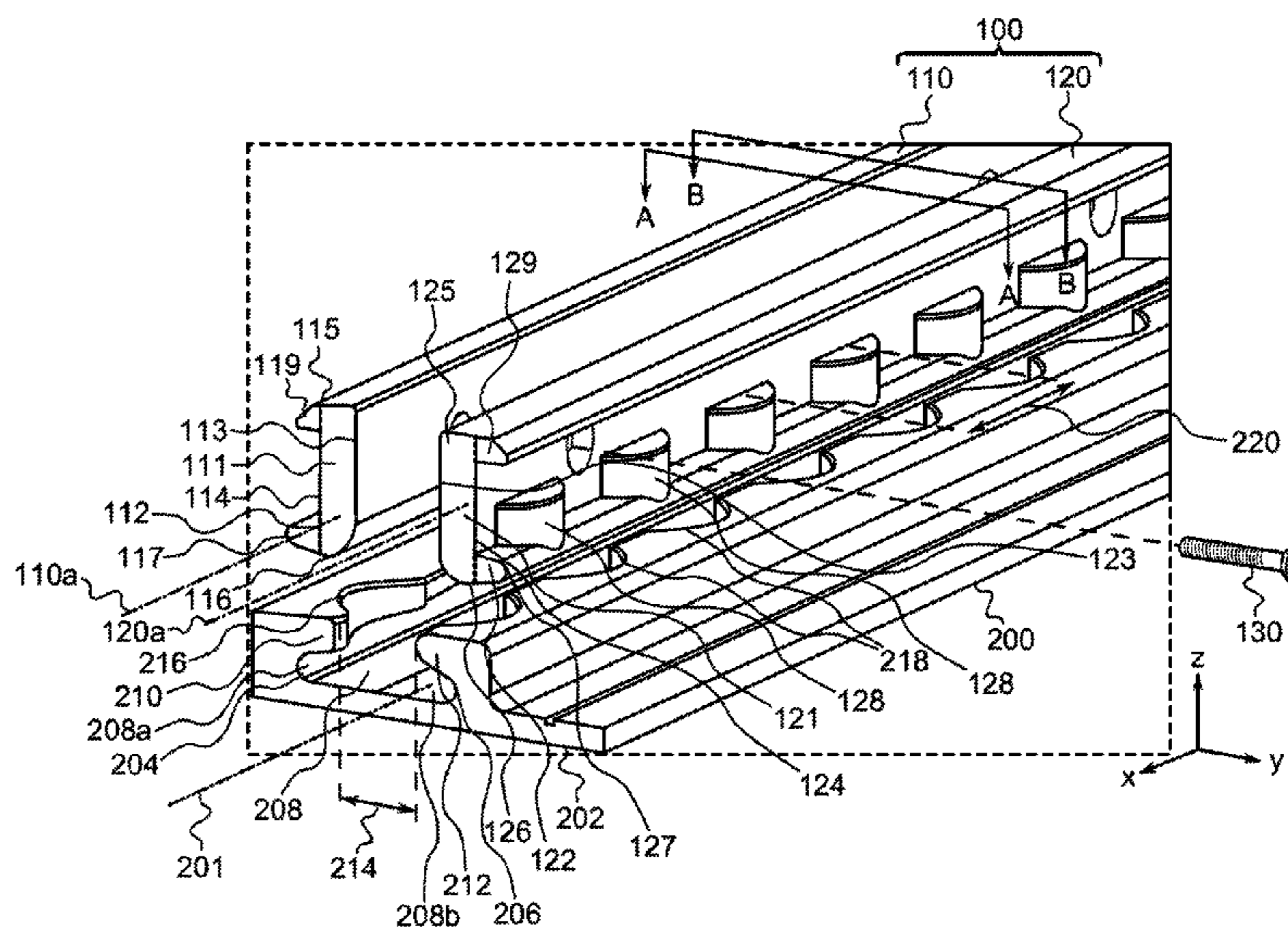
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(57) **ABSTRACT**

A seat rail adapter for flexibly mounting an object onto a seat rail, a seat arrangement and a cabin arrangement with same are described. The seat rail has a U-shaped profile with a lower flange, two web portions, two upper flanges, a gap between the upper flanges, and a cavity inside the seat rail. The seat rail adapter includes two mounting parts capable of being inserted through the gap into the cavity inside the seat rail, such that, when inserted, a hook portion of each of the mounting parts is engaged with the cavity, and a shaft portion of each of the two mounting parts extends through the gap to outside the seat rail. Further, the shaft portions include a rounding so as to allow insertion of one mounting part into the cavity by a swivel movement, when the other mounting part is already inserted therein.

**14 Claims, 8 Drawing Sheets**



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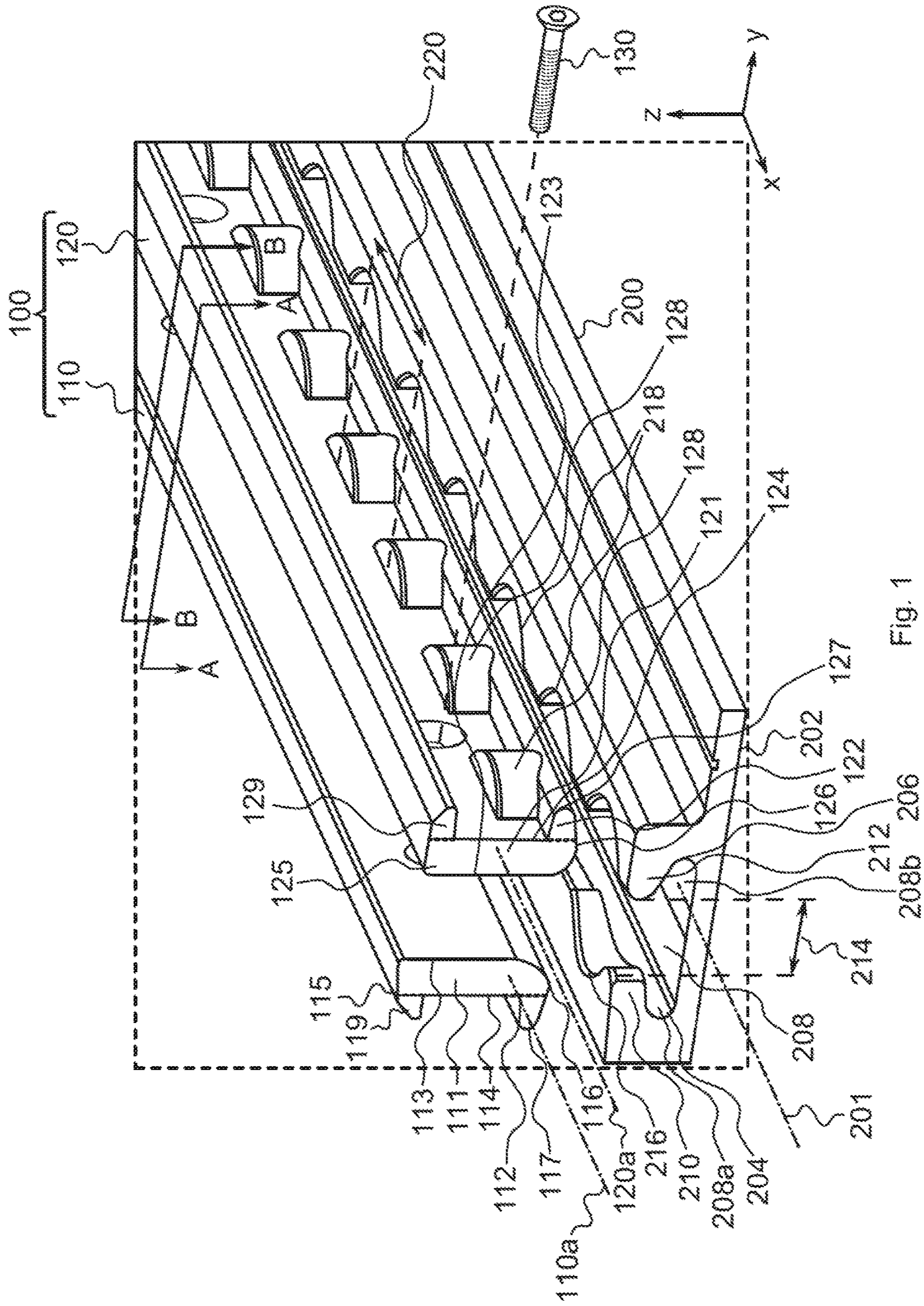


Fig. 1

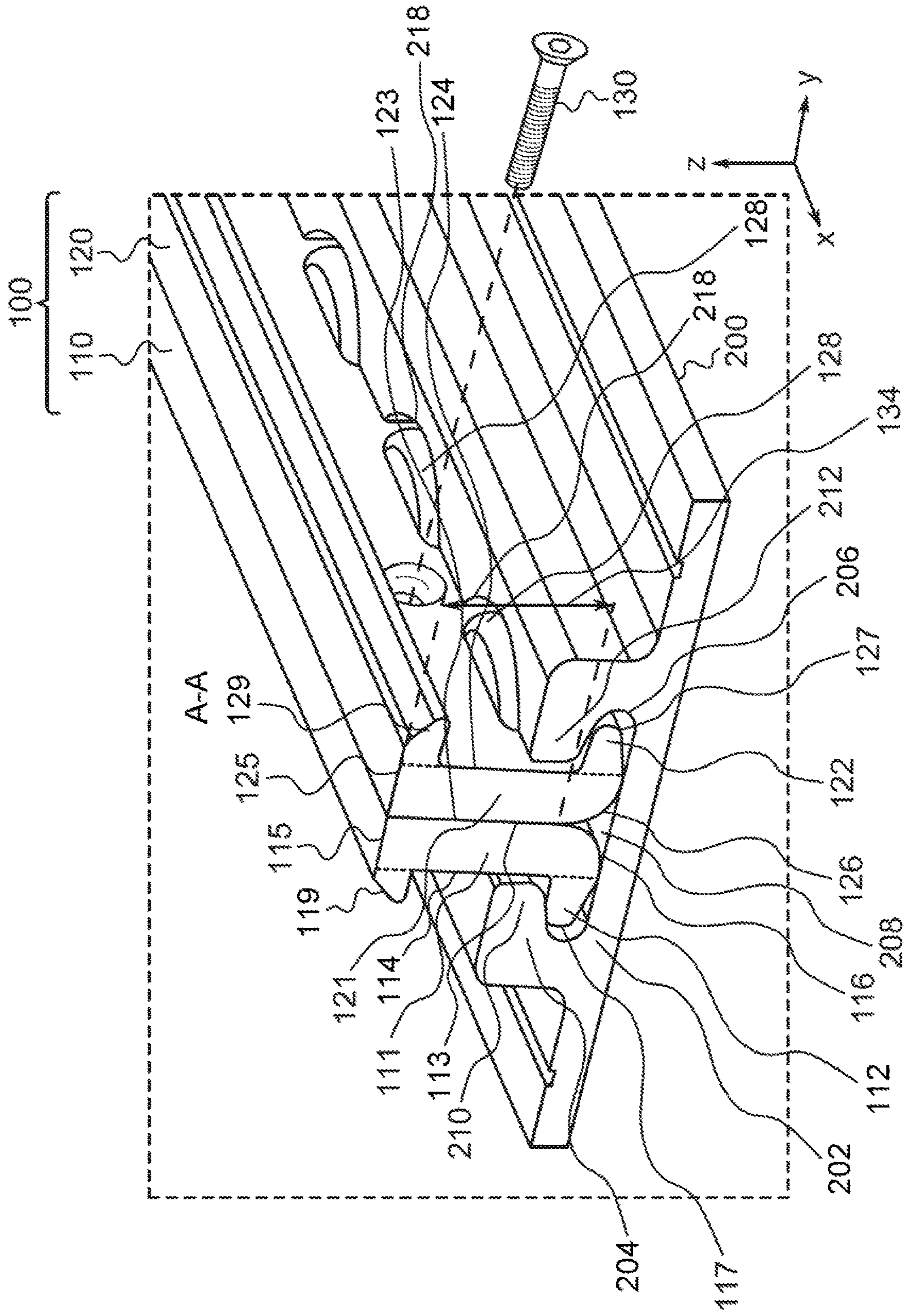


Fig. 2



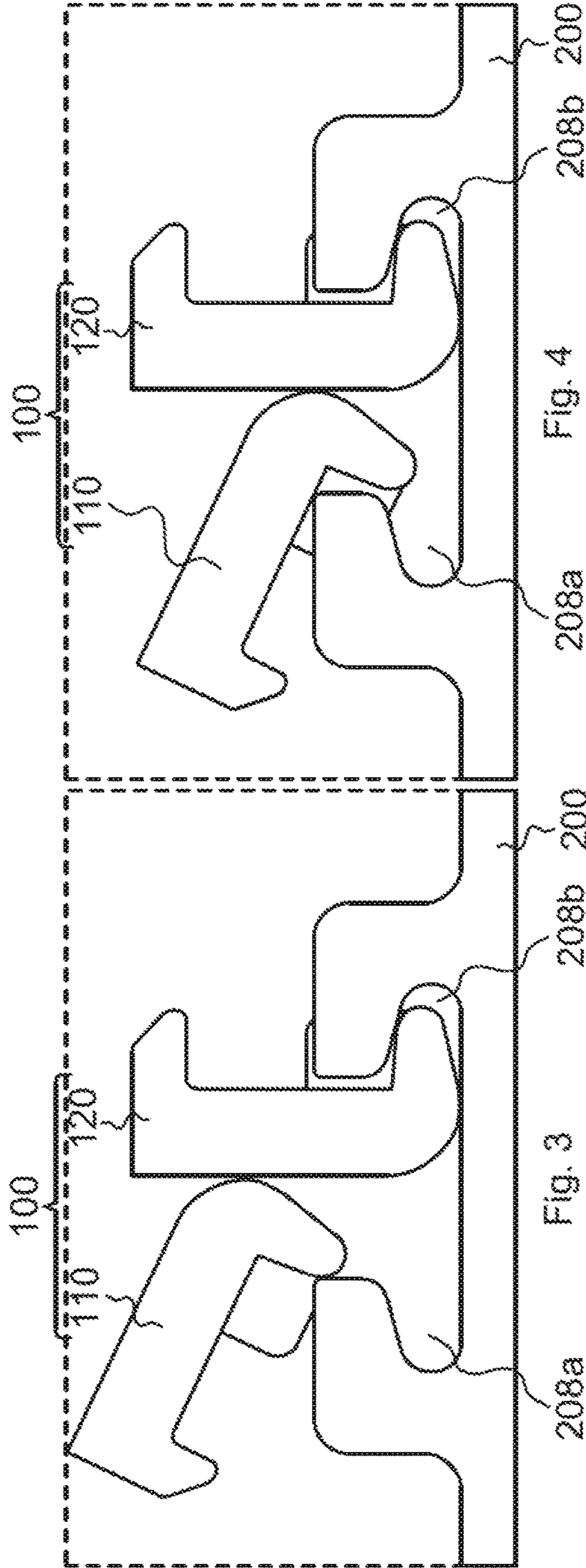


Fig. 3

Fig. 4

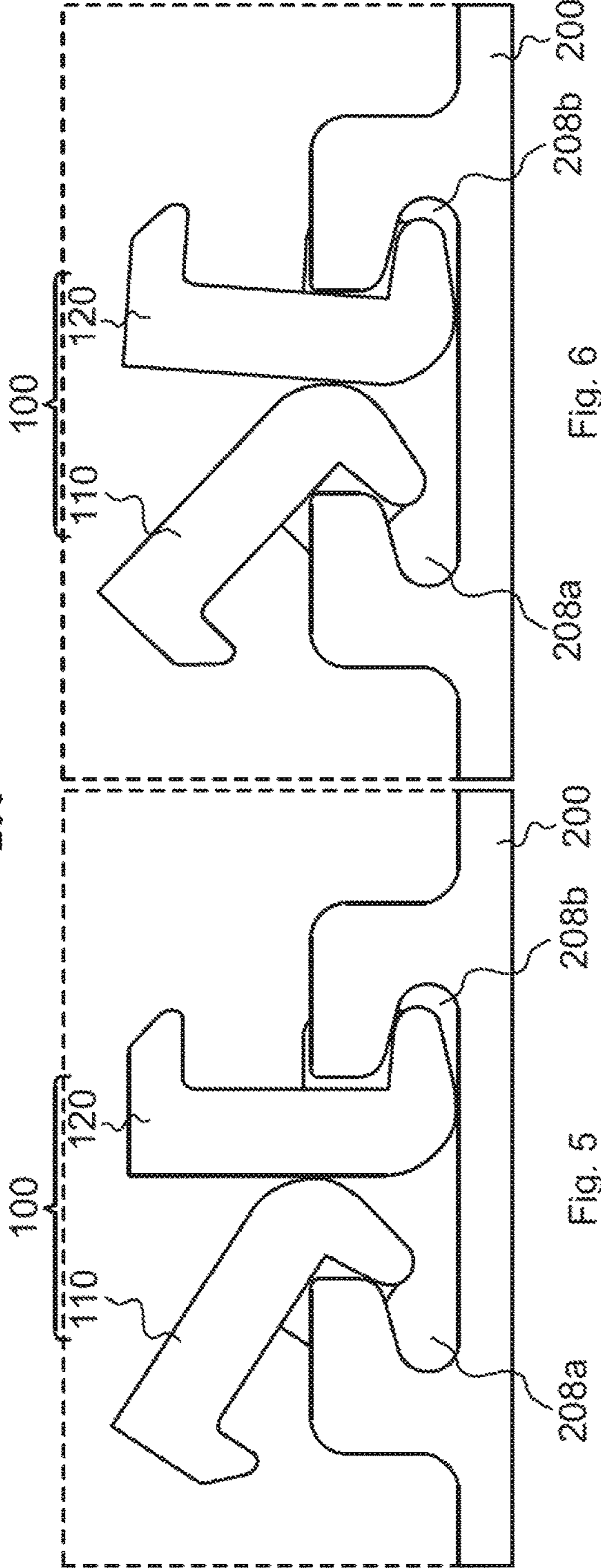


Fig. 5

Fig. 6

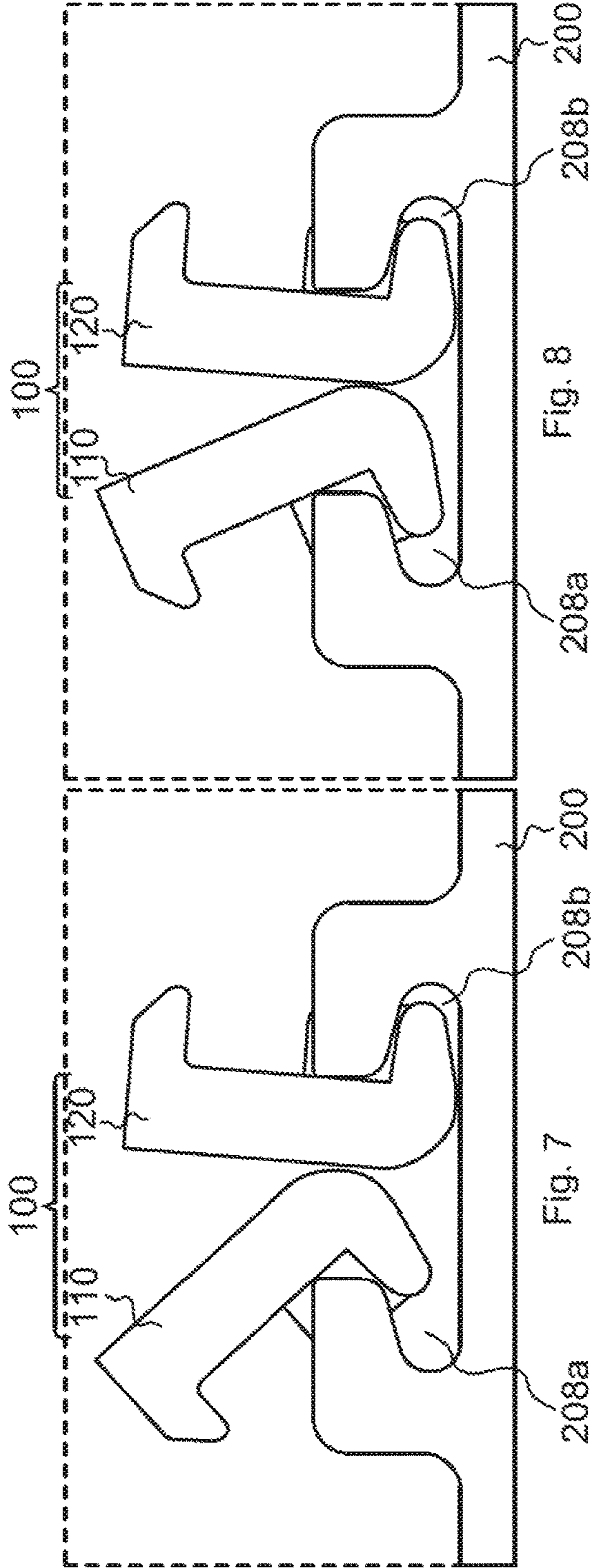


Fig. 8

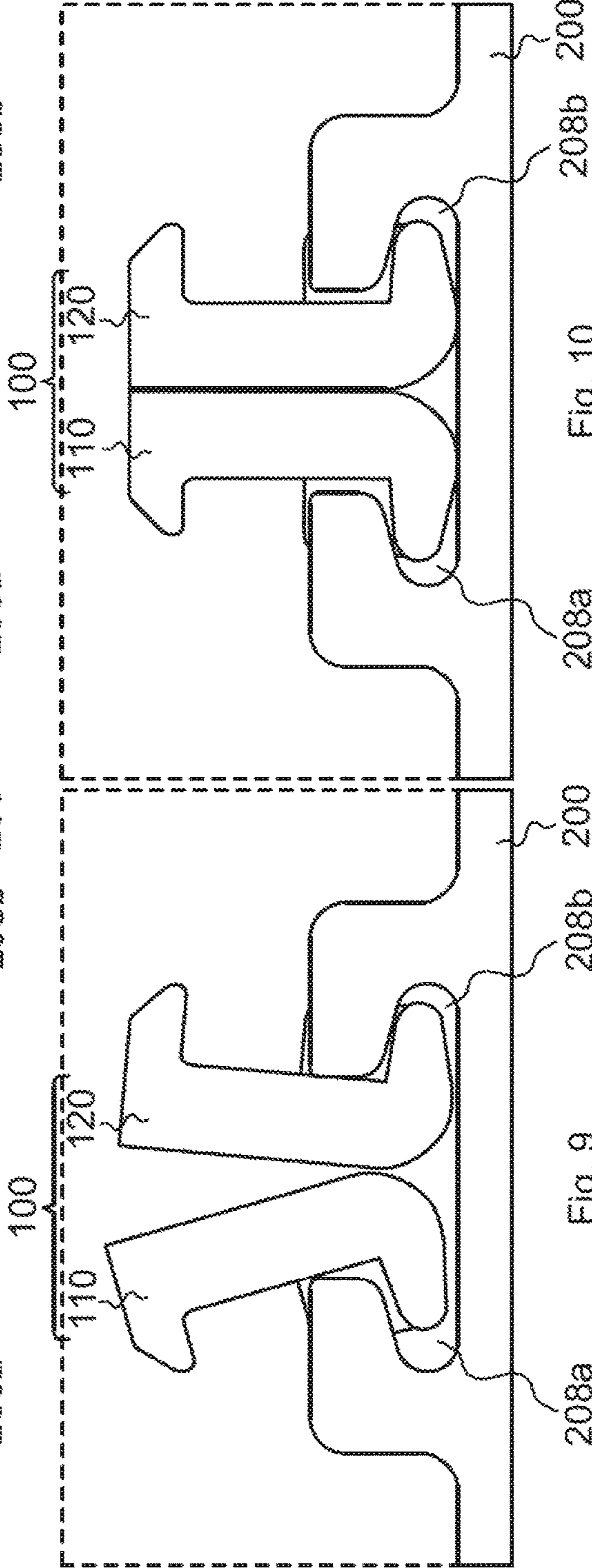


Fig. 10

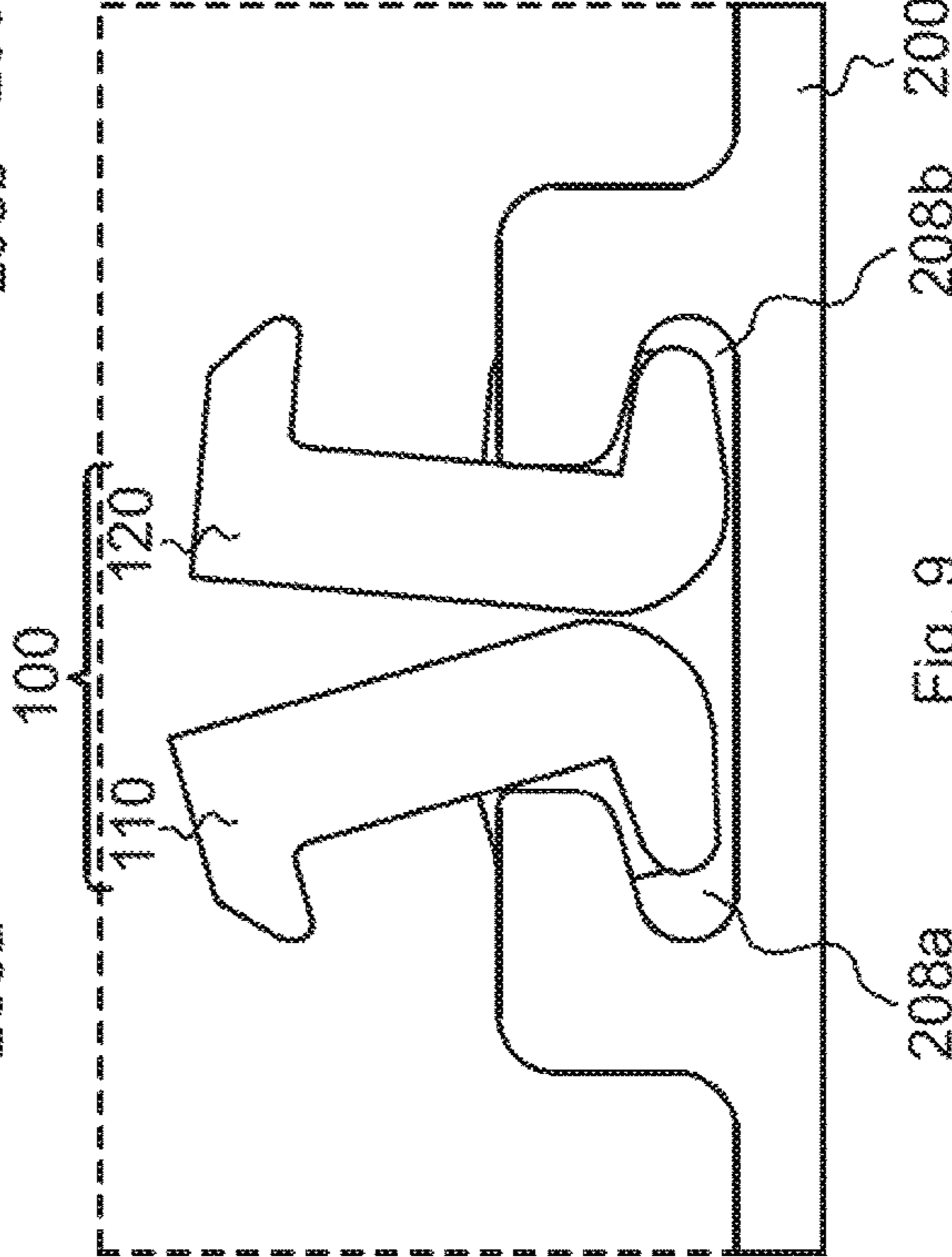


Fig. 9



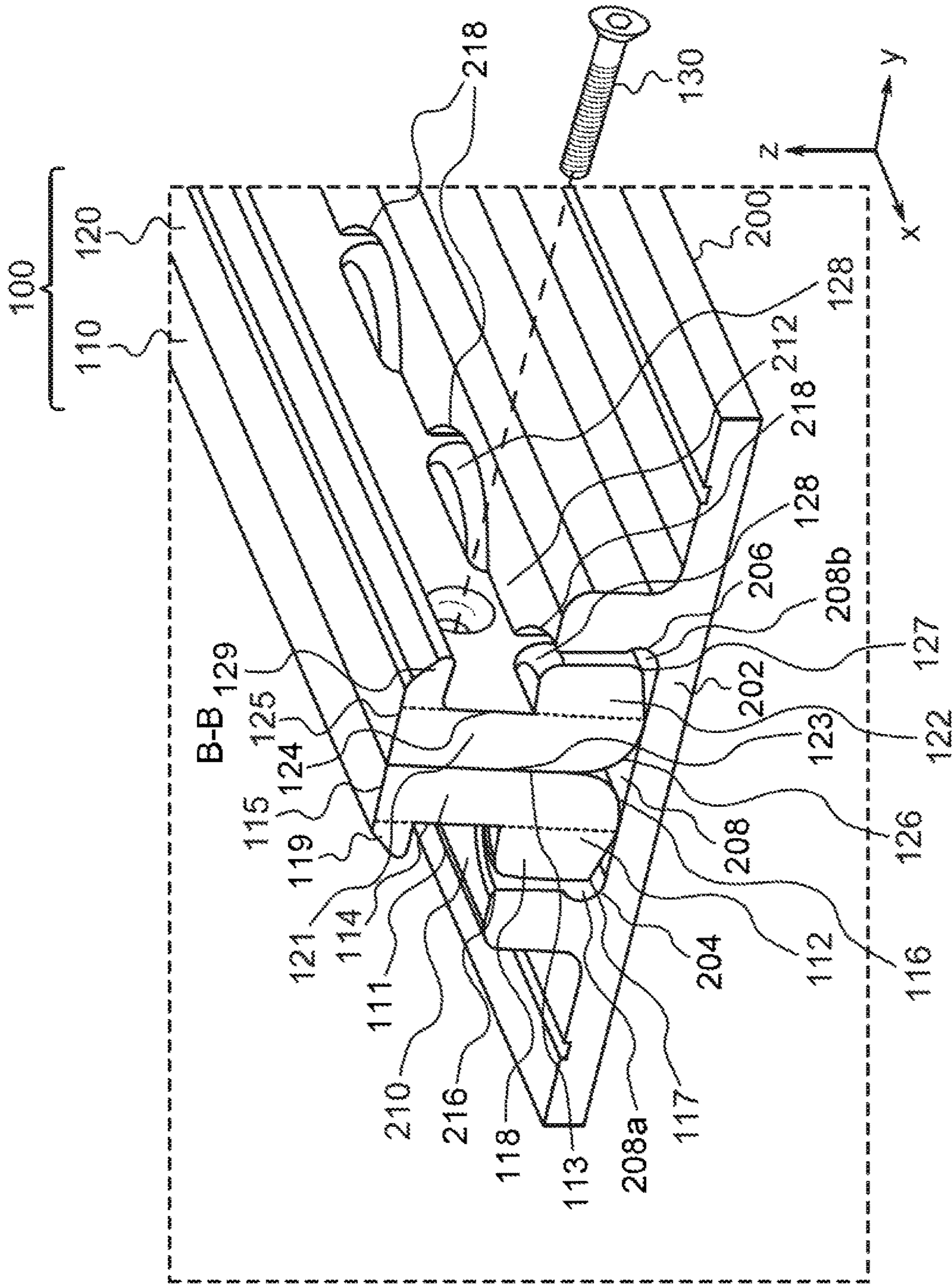


Fig. 11

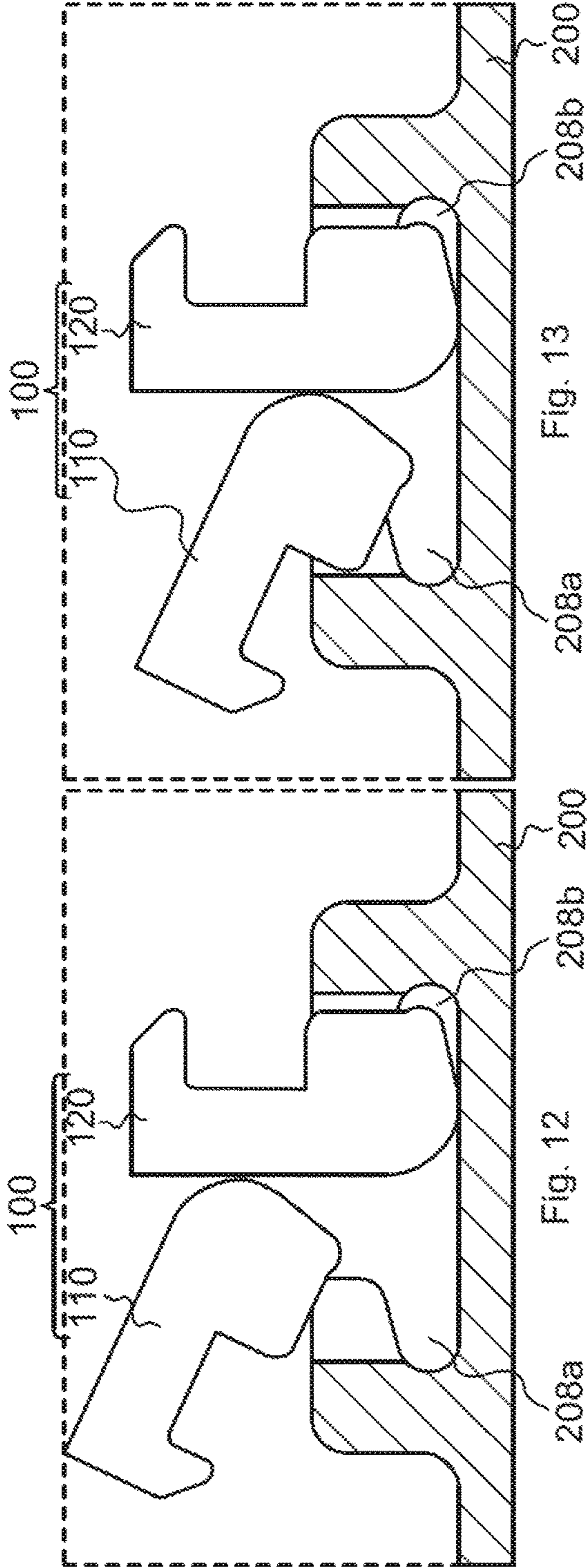


Fig. 13

Fig. 12

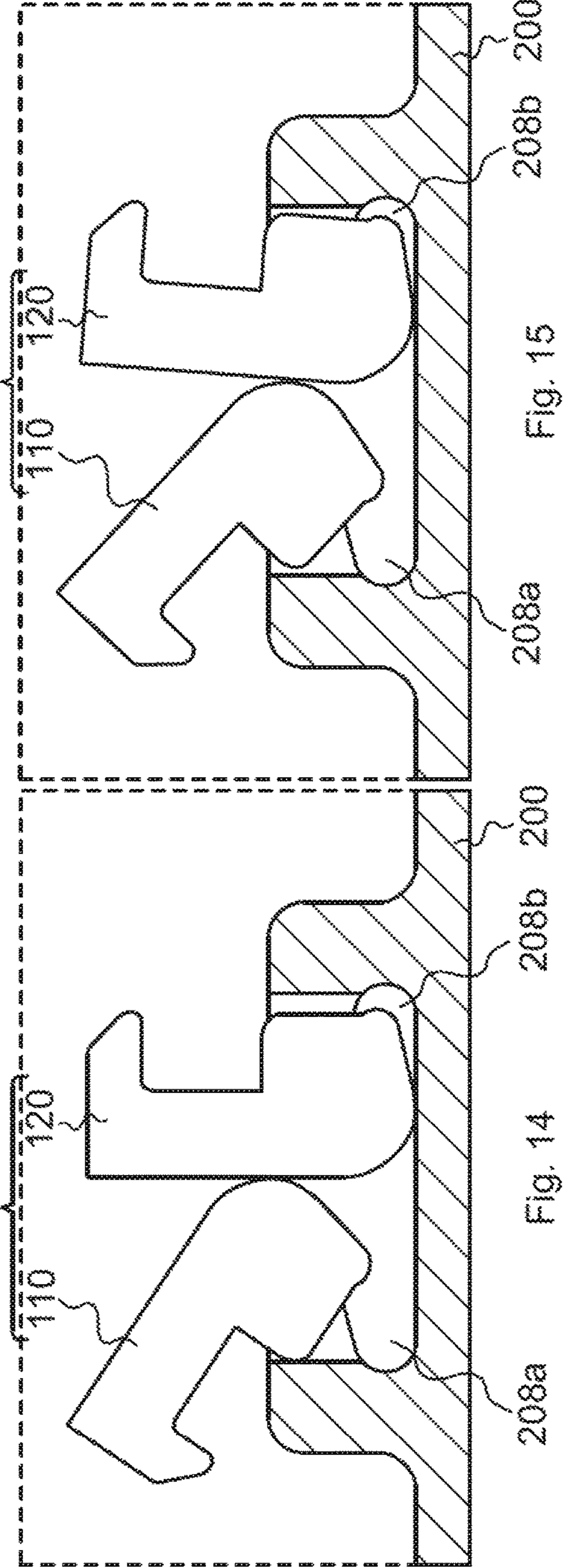


Fig. 15

Fig. 14



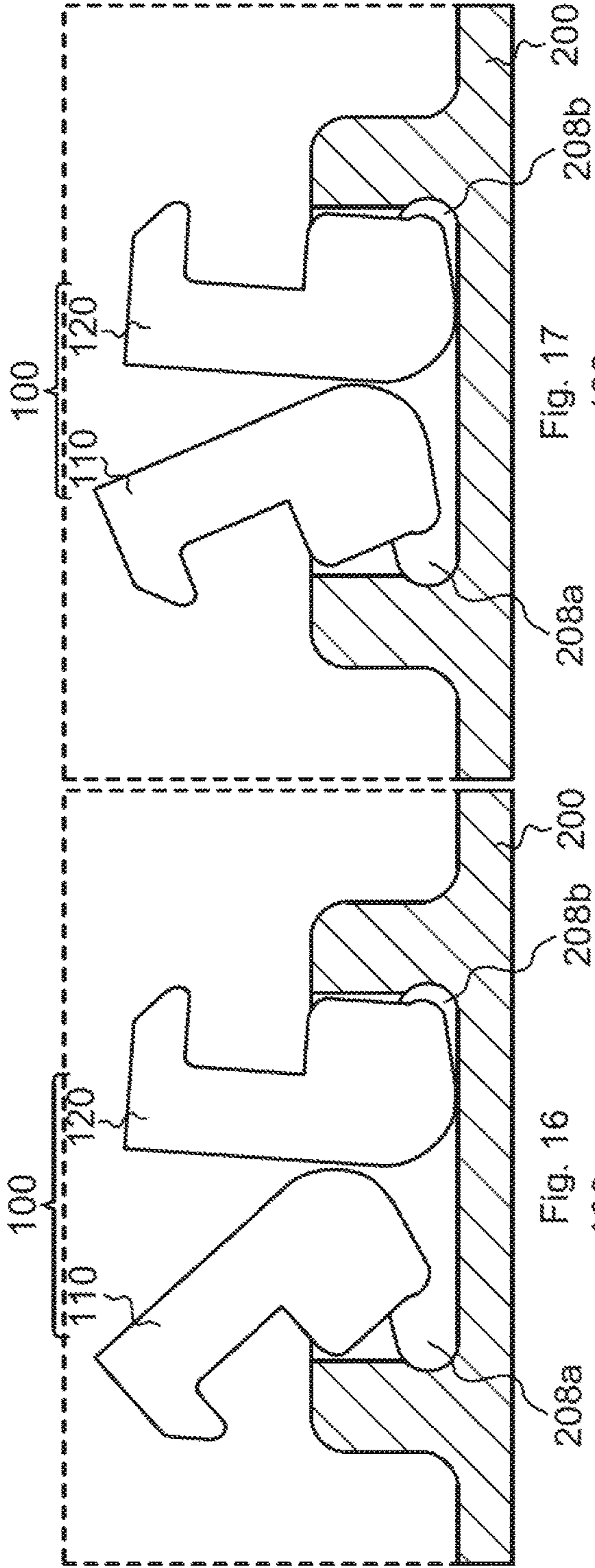


Fig. 16

Fig. 17

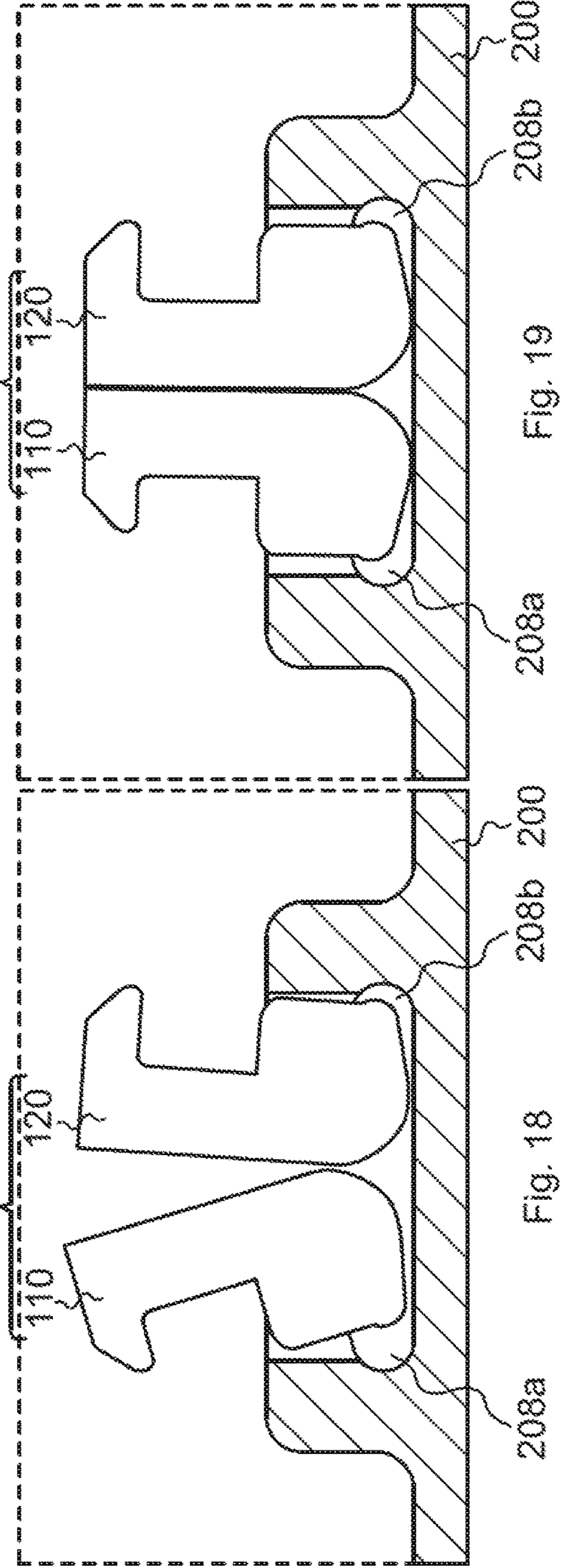


Fig. 18

Fig. 19

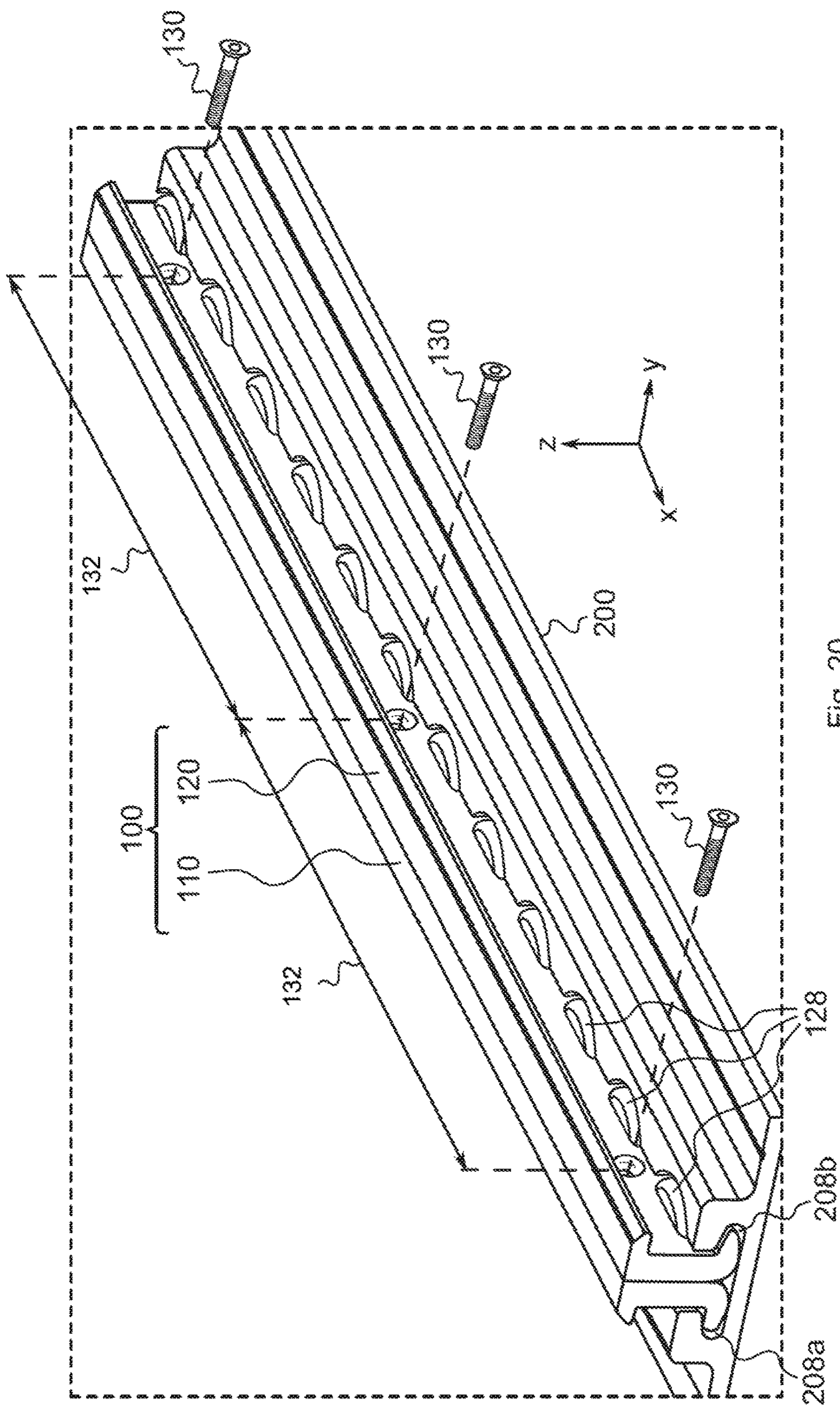


Fig. 20



1

**SEAT RAIL ADAPTER COMPRISING TWO  
MOUNTING PARTS, SEAT RAIL AND CABIN  
ARRANGEMENT COMPRISING SUCH A  
SEAT RAIL ADAPTER**

FIELD OF THE INVENTION

The invention relates to a seat rail adapter comprising two mounting parts, a seat rail arrangement and a cabin arrangement comprising such a seat rail adapter with the two mounting parts.

BACKGROUND OF THE INVENTION

Conventionally, seat rail adapters are known to mount objects, for example seats, structural elements or cargo onto a seat rail in a vehicle. Such seat rail adapters are commonly used in transportation vehicles, such as aircrafts, trains and busses.

In the art, various types of seat rail adapters are known. For example, seat rail adapters exist in the shape of a rail to allow a flexible mounting of objects thereon. Seat rail adapters in a rail shape enable objects, for instance seats, to be slidably positioned on the seat rail adapter, thereby allowing the flexible mounting without restrictions by a grid of the seat rail.

An exemplary seat rail adapter in a rail shape is disclosed in DE 10 2015 117 709. This seat rail adapter comprises multiple elements with separate functions. Notably, the different elements have to be secured to each other with fastening elements, such as screws, to provide a fixed basis for mounting an aircraft seat.

The known seat rails, for example of commercial aircrafts, are used for attaching passenger seats, and are standardized, for example according to the aviation standard LN 29 890, which in its edition 1971-05 is incorporated herein by reference.

Such seat rails share a common configuration, where on a lower support element, preferably on a  $\Omega$ -shaped or a T-shaped lower support element, a profile element, preferably a U-shaped profile element, is arranged. The profile element, in particular the U-shaped profile element preferably comprises a gap that points upward, i.e. into the cabin. This gap is provided between two inward projecting flanges. The gap is configured with holes (or widenings) and slits (or neckings) in alternating succession, thereby defining a grid of the seat rail.

An exemplary seat rail with such a profile element is disclosed in DE 10 2009 039 581. This seat rail is a hard coated seat rail where at least the support element for attaching seats is manufactured from aluminum or aluminum alloy. The surface of the aluminum or the aluminum alloy includes an oxide layer that has been manufactured by means of hard anodic oxidation.

BRIEF SUMMARY OF THE INVENTION

An aspect of the invention proposes a seat rail adapter which allows an easy and convenient mechanism for inserting a seat rail adapter in the seat rail while at the same time allowing for a fast reconfiguration of an object's mounting position on the seat rail.

According to a first aspect of the invention, a seat rail adapter is proposed for flexibly mounting an object onto a seat rail.

The seat rail extends along a rail longitudinal axis and has a U-shaped profile or C-shaped profile comprising a lower

2

flange portion, a first web portion extending upwards from the lower flange portion, and a second web portion extending upwards from the lower flange portion in a position spaced apart from the first web portion so as to form a cavity between the lower flange portion, the first web portion and the second web portion. The U-shaped profile of the seat rail further comprises a first upper flange portion extending from the first web portion inwardly towards the second web portion so as to form a first cavity section between the lower flange portion, the first web portion and the first upper flange portion. The U-shaped profile of the seat rail also comprises a second upper flange portion extending from the second web portion inwardly towards the first web portion so as to form a second cavity section between the lower flange portion, the second web portion and the second upper flange portion. A gap is provided between the first upper flange portion and the second upper flange portion in order to allow access to the cavity from outside the seat rail.

The seat rail adapter comprises a first mounting part and a second mounting part. Both, the first mounting parts and the second mounting part are configured to be inserted through the gap into the cavity of the seat rail and to engage with the cavity. The first mounting part extends along a first longitudinal adapter axis and has a profile comprising a first shaft portion and a first hook portion. The first shaft portion has an inner side and an opposite outer side as well as an upper end and an opposite lower end. The first hook portion projects away from the outer side at the lower end of the first shaft portion. The second mounting part extends along a second longitudinal adapter axis and has a cross-profile comprising a second shaft portion and a second hook portion. The second shaft portion has an inner side and an opposite outer side as well as an upper end and an opposite lower end. The second hook portion projects from the outer side at the lower end of the second shaft portion.

The first and second mounting parts are formed to engage with the cavity of the seat rail in such a manner that a) the first hook portion engages with the first cavity section while the second hook portion engages with the second cavity section, b) that the first shaft portion and the second shaft portion extend from the cavity through the gap to outside the seat rail while the inner side of the first shaft portion lies opposite the inner side of the second shaft portion, and c) that the first longitudinal adapter axis and the second longitudinal adapter axis are aligned with the rail longitudinal axis. The inner side at the lower end of the first shaft portion of the first mounting part and/or the inner side at the lower end of the second shaft portion of the second mounting part is rounded so as to allow insertion of one of the first and second mounting parts into the cavity by a swivel movement, when the other one of the first and second mounting parts is already inserted in the cavity.

Advantageously, this configuration of a seat rail adapter provides an easy and convenient mechanism for inserting a seat rail adapter in the seat rail while at the same time allowing for a fast reconfiguration of an object's mounting position on the seat rail.

In a preferred embodiment of the seat rail adapter, according to the invention, the first and second mounting parts are formed such that the swivel axis for inserting one of the first and second mounting parts into the cavity, when the other one of the first and second mounting parts is already inserted, extends along a tip of the hook portion of the mounting part. Advantageously, this definition of the swivel axis provides for a small radius to the rounded (or curved) lower end of the inner side of the at least one of the two



3

mounting parts, thereby enlarging the inner surface at which the shaft portions of both mounting parts may abut on each other.

In another preferred embodiment of the seat rail adapter, according to the invention, when the first and second mounting parts are inserted into the cavity, the first shaft portion and the second shaft portion extend in parallel through the gap to the outside of the seat rail. Advantageously, this configuration of the shafts portions extending in parallel to one another enables the two mounting parts to support each other, thereby achieving a stable mounting position.

In a further preferred embodiment of the seat rail adapter, according to the invention, when the first and second mounting parts are inserted into the cavity, the first shaft portion and the second shaft portion abut one another. Advantageously, this configuration of the shafts abutting one another allows the two mounting parts to self-support each other, thereby achieving an even more stable mounting position.

In yet another preferred embodiment of the seat rail adapter, according to the invention, when the first and second mounting parts are inserted into the cavity, the projecting first and second hook portions both point in opposite directions. Advantageously, this construction of the two mounting parts allows the hook portions thereof to engage securely with the first and second cavity sections provided by the seat rail.

In an even further preferred embodiment, according to the invention, the seat rail adapter further comprises a fastening element for fastening the first shaft portion to the second shaft portion, when the first and second mounting parts are inserted into the cavity. Advantageously, the fastening element maintains the two mounting parts in the inserted position in the seat rail. At the same time the fastening element does not secure the seat rail adapter to the seat rail.

In another preferred embodiment of the seat rail adapter, according to the invention, the fastening element is one of a screw, a bolt, a nut or another element suitable for providing a releasable connection between the two mounting parts. In such a way, reliable, simple and quick fastening is possible.

In a further preferred embodiment of the seat rail adapter, according to the invention, when the first and second mounting parts are inserted into the cavity, the upper end of the first shaft portion and the upper end of the second shaft portion are configured to form, together, a support for flexibly mounting the object. Advantageously, this configuration of the upper ends of the first and second shaft portions equally distributes the load onto both mounting parts, thereby minimizing the risk of an uneven wear of the seat rail.

In yet another preferred embodiment of the seat rail adapter, according to the invention, the first shaft portion at its outer side above the first hook portion is provided with a first structure configured to engage with a corresponding first counter structure provided at a tip of the first upper flange portion that points to the second upper flange portion of the seat rail, and/or wherein the second shaft portion at its outer side above the second hook portion is provided with a second structure configured to engage with a corresponding second counter structure provided at a tip of the second upper flange portion that points to the first upper flange portion of the seat rail. Advantageously, this configuration of the outer sides of the first and second shaft portion secures the seat rail adapter along the longitudinal rail axis.

In an even further preferred embodiment of the seat rail adapter, according to the invention, the first structure is formed as a plurality of subsequent widenings and neckings alternating along the first longitudinal adapter axis, adapted to engage with the first counter structure formed as corre-

4

sponding neckings and widenings alternating along the rail longitudinal axis and/or wherein the second structure is formed as a plurality of subsequent widenings and neckings alternating along the second longitudinal adapter axis, adapted to engage with the second counter structure formed as corresponding neckings and widenings alternating along the rail longitudinal axis. Advantageously, this configuration of the outer sides of the first and second shaft portion further secures the seat rail adapter in the longitudinal direction in the seat rail.

In another preferred embodiment of the seat rail adapter, according to the invention, the widenings of the first structure and the neckings of the first counter structure are formed as segments of a cylinder, and/or wherein the widenings of the second structure and the neckings of the second counter structure are formed as segments of a cylinder. Advantageously, this configuration of the outer sides of the first and second shaft portion even further secures the seat rail adapter in the longitudinal direction in the seat rail.

In a further preferred embodiment of the seat rail adapter, according to the invention, the neckings of the first structure and the widenings of the first counter structure are formed as flat sections connecting two adjacent segments of a cylinder, and/or wherein the neckings of the second structure and the widenings of the second counter structure are formed as flat sections connecting two adjacent segments of a cylinder. Advantageously, this configuration of the outer sides of the first and second shaft portion enables a symmetrical construction thereof with first and second upper flange portions.

In a second aspect of the invention, a seat rail arrangement is suggested, comprising a seat rail extending along a rail longitudinal axis and having a U-shaped profile with a lower flange portion, a first web portion extending upwards from the lower flange portion, a second web portion extending upwards from the lower flange portion spaced apart from the first web portion so as to form a cavity between the lower flange portion, the first web portion and the second web portion, a first upper flange portion extending from the first web portion inwardly towards the second web portion so as to form a first cavity section between the lower flange portion, the first web portion and the first upper flange portion, and a second upper flange portion extending from the second web portion inwardly towards the first web portion so as to form a second cavity section between the lower flange portion, the second web portion and the second upper flange portion, wherein a gap is provided between the first upper flange portion and the second upper flange portion in order to allow access to the cavity from outside the seat rail; and a seat rail adapter according to one of the embodiments described before.

Advantageously, this configuration of a seat rail arrangement also provides an easy and convenient mechanism for inserting a seat rail adapter in the seat rail while at the same time allowing for a fast reconfiguration of an object's mounting position on the seat rail.

According to a third aspect of the invention a cabin arrangement is proposed, comprising a seat rail extending along a rail longitudinal axis and having a U-shaped profile with a lower flange portion, a first web portion extending upwards from the lower flange portion spaced apart from the first web portion so as to form a cavity between the lower flange portion, the first web portion and the second web portion, a first upper flange portion extending from the first web portion inwardly towards the second web portion so as to form a first cavity section between the lower flange portion, the first web portion and the first upper



5

flange portion, and a second upper flange portion extending from the second web portion inwardly towards the first web portion so as to form a second cavity section between the lower flange portion, the second web portion and the second upper flange portion, wherein a gap is provided between the first upper flange portion and the second upper flange portion in order to allow access to the cavity from outside the seat rail; an object; and a seat rail adapter for flexibly mounting the object onto the cabin, wherein the seat rail adapter is configured according to one of the embodiments described before.

Advantageously, this configuration of a cabin arrangement also provides an easy and convenient mechanism for inserting a seat rail adapter in the seat rail while at the same time allowing for a fast reconfiguration of an object's mounting position on the seat rail.

In a preferred embodiment of the cabin arrangement, according to the invention, the object to be mounted is one of a seat, a structural element, or cargo.

In the following, the invention will be explained in more detail with reference being made to the embodiment depicted in the accompanying drawing, by way of example only.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a perspective view of a seat rail adapter comprising two mounting parts according to one embodiment of the invention and a seat rail for insertion therein;

FIG. 2 illustrates a perspective view of a seat rail adapter along the cross section A-A indicated in FIG. 1, comprising two mounting parts, when inserted in a seat rail according to the one embodiment of the invention;

FIGS. 3-10 illustrate a procedure of inserting a seat rail adapter according to the one embodiment of the invention in a seat rail, namely along the cross section A-A indicated in FIG. 1;

FIG. 11 shows another perspective view of a seat rail adapter along the cross section B-B indicated in FIG. 1, comprising two mounting parts, when inserted in a seat rail according to the one embodiment of the invention;

FIGS. 12-19 illustrate a method of inserting a seat rail adapter according to the one embodiment of the invention in a seat rail, namely along the cross section B-B indicated in FIG. 1; and

FIG. 20 illustrates a reduced perspective view of a seat rail adapter with fastening elements in the inserted state in a seat rail according to another embodiment of the invention.

#### DETAILED DESCRIPTION

Referring now to FIG. 1, a perspective view of the seat rail adapter 100 according to one embodiment of the invention is shown. Particularly, in FIG. 1 the seat rail adapter 100 is illustrated separate from a seat rail 200, in form of an exploded assembly drawing. Further to FIG. 1, two cross-sections are indicated along the lines A-A and B-B which are substantially perpendicular to a rail longitudinal direction (i.e. extending along the x-axis in FIG. 1) of the seat rail 200. These cross-sections A-A and B-B help understanding the remaining drawings of the seat rail adapter 100.

In more detail, the cross-section along the line A-A is further detailed in FIG. 2-10, where the cross-section is in alignment with one of the widenings of the seat rail 200. Further, the cross-section along the line B-B is further detailed in FIGS. 11-19, where the cross-section is in alignment with one of the neckings of the seat rail 200. In

6

other words, the lines A-A and B-B are spaced apart by half of a grid pitch 220 in the longitudinal rail axis (i.e. along the x-axis in FIG. 1). The term grid pitch 220 refers to the distance between two consecutive widenings (or two consecutive neckings) in the longitudinal rail axis.

The seat rail adapter 100 of this embodiment is configured for flexibly mounting an object onto the seat rail 200, wherein the object can be one of an aircraft seat, a structural element or cargo. In particular, this aircraft adapter 100 overcomes the disadvantages of discrete mounting position corresponding to a grid of the seat rail.

In particular, the seat rail adapter 100 mounts objects independently of pre-configured mounting positions, thereby enabling continuous, non-discrete mounting position of objects along the longitudinal rail axis. The object may be slidably positioned on the seat rail adapter 100 facilitating the flexible mounting without restrictions by a grid of the seat rail.

In the context of the invention, a seat rail adapter allows a flexible mounting of an object, if the mounting position thereof is not restricted by the grid of the seat rail. In other words, the seat rail adapter flexibly mounts objects on a support, where the objects can be slidably positioned on before securing them to the seat rail adapter. This enables the mounting position of the object to be adjustable in steps smaller than the grid pitch.

The seat rail 200 extends along a rail longitudinal axis 201 (in parallel to the x-axis in FIG. 1). This rail longitudinal axis 201 of the seat rail 200 conventionally corresponds to the longitudinal axis of the aircraft cabin and extends along the entire length thereof.

Further, the seat rail 200 has a U-shaped profile when viewed from across the rail longitudinal axis 201 (i.e. has a U-shaped cross-section in the plane defined by the y- and z-axis in FIG. 1). The seat rail 200 comprises a lower flange portion 202. The lower flange portion 202 is a horizontal lower flange portion (i.e. extend along the x-axis in FIG. 1). Further, the lower flange portion 202 is configured to be mounted or rest against the floor of an aircraft cabin.

The seat rail 200 further comprises a first web portion 204 extending upwards from the lower flange portion 202, and a second web portion 206 extending upwards from the lower flange portion 202 spaced apart from the first web portion 204. The first and the second web portions 204, 206 are vertical web portions (i.e. extend along the z-axis in FIG. 1). Further, the first and the second web portions 204, 206 are both arranged in parallel to each other.

The first and the second web portions 204, 206 are arranged so as to form a cavity 208 between the lower flange portion 202, the first web portion 204 and the second web portion 206. In other words, the lower flange portion 202, and the first and second web portions 204, 206 surround the cavity 208 of the seat rail 200.

The seat rail 200 further comprises a first upper flange portion 210 that extends from the first web portion 204 inwardly towards the second web portion 206. The seat rail 200 also comprises a second upper flange portion 212 that extends from the second web portion 206 inwardly towards the first web portion 204.

The first and second upper flange portions 210, 212 respectively are horizontal upper flange portions (i.e. extend along the x-axis in FIG. 1) arranged in parallel to the lower flange portion 202. The first and second upper flange portions 210, 212 further surround the cavity 208 formed by the lower flange portion 202, the first web portion 204 and the second web portion 206.



In particular, the first upper flange portion **210** extends inwardly from the first web portion **204** so as to form a first cavity section **208a** between the lower flange portion **202**, the first web portion **204** and the first upper flange portion **210**. The second upper flange portion **211** extends inwardly from the second web portion **206** so as to form a second cavity section **208b** between the lower flange portion **202**, the second web portion **204** and the second upper flange portion **212**. The first and second cavity sections **208a**, **208b** are parts of the cavity **208**.

Further to the seat rail **200**, a gap **214** is provided between the first upper flange portion **210** and the second upper flange portion **212**. This gap **214** is provided in order to allow access to the cavity **208** from outside the seat rail **200**, namely to allow access to the seat rail adapter **100**. The seat rail adapter **100** comprises a first mounting part **110** and a second mounting part **120**, both configured to be inserted through the gap **214** of the seat rail **200** and configured to engage with the cavity **208** of the seat rail **200**. Thereby, the seat rail adapter enables mounting the objects, such as aircraft seats, structural elements, and/or cargo, onto the seat rail **200**.

For this purpose, each of the first and second mounting parts **110**, **120** of the seat rail adapter **100** comprises a first or second shaft portion **111**, **121** and a first or second hook portion **112**, **122**, respectively. In short, the first and second hook portions **112**, **122** are configured to engage with the cavity **208** of the seat rail **200** whereas the first and second shaft portions **111**, **121** of the first and second mounting parts **110**, **120** establish a mechanical connection to the outside of the seat rail **200**.

In one example, the first and second mounting parts **110**, **120** are each formed as one piece. Then, the first and second shaft portion **111**, **121** can only be distinguished from the respective first and second hook portion **112**, **122** through its function. In another example the first and second shaft portion **111**, **121** and the first and second hook portions **112**, **122** are each formed as separate pieces, which are joined together to form the first and second mounting parts **110**, **120**.

In the context of the invention, the first and second mounting parts **110**, **120** shall each be understood as one (i.e. single) unit which cannot be disassembled into separate pieces after its assembly. In other words, the first and second mounting parts have a fixed geometry and dimension which, as such, enables them to be inserted through the gap **214** and to engage with the cavity **208** of the seat rail **200**.

The following description of the first and second mounting parts **110**, **120** focusses on the case where both mounting parts are inserted in the cavity **208** of the seat rail **200**. This serves the purpose to characterize the configuration of the first and second mounting parts **110**, **120** that allows the mounting parts to engage with the cavity **208**. Irrespective thereof, it shall again be emphasized that each of the first and second mounting parts **110**, **120** is removable from the seat rail **200**, hence independent therefrom.

The first mounting part **110** of the seat rail adapter **100** extends along a first longitudinal adapter axis **110a** (i.e. extends in parallel to the x-axis in FIG. 1) and has a cross-profile (i.e. in the plane defined by the y- and z-axis in FIG. 1) comprising a first shaft portion **111** and a first hook portion **112**. In other words, the first mounting part **110** has a C-shaped or L-shaped profile when viewed across the first longitudinal adapter axis **110a** (i.e. in a plane along the y- and z-axis in FIG. 1).

Particularly, the first shaft portion **111** of the first mounting part **110** is a vertical first shaft portion (i.e. extends along

the z-axis in FIG. 1) and the first hook portion **112** thereof is a horizontal first hook portion (i.e. extends along the x-axis in FIG. 1).

The first shaft portion **111** of the first mounting part **110** has an inner side **113** and an opposite outer side **114**. The inner and outer sides **114**, **116** of the first shaft portion **111** extend along the first longitudinal adapter axis **110a** (i.e. extend along the x-axis in FIG. 1). In other words, the inner and outer sides are lateral sides of the first shaft portion **111** with respect to the first longitudinal adapter axis **110a** (i.e. along the x-axis in FIG. 1).

Further, the first shaft portion **111** of the first mounting part **110** has an upper end **115** and an opposite lower end **116**. The first hook portion **112** projects horizontally from the outer side **114** (i.e. extends along the y-axis in FIG. 1) at the lower end **116** of the first shaft portion **111**. In other words, the first hook portion **112** of the first mounting part **110** forms at the lower end **116** of the first shaft portion **111** a horizontal projection (i.e. extending along the y-axis in FIG. 1) with respect to the outer side **114** of the first shaft portion **111**.

Further, the second mounting part **120** of the seat rail adapter **100** extends along a second longitudinal adapter axis **120a** (i.e. extends in parallel to the x-axis in FIG. 1) and has a cross-profile (i.e. in the plane defined by the y- and z-axis in FIG. 1) comprising a second shaft portion **121** and a second hook portion **122**. In other words, the second mounting part **120** has a C-shaped or L-shaped profile when viewed across the second longitudinal adapter axis **120a** (i.e. in a plane along the y- and z-axis in FIG. 1).

Particularly, the second shaft portion **121** of the second mounting part **120** is a vertical second shaft portion (i.e. extends along the z-axis in FIG. 1) and the second hook portion **122** thereof is a horizontal second hook portion (i.e. extends along the x-axis in FIG. 1).

The second shaft portion **121** of the second mounting part **120** has an inner side **123** and an opposite outer side **124**. The inner and outer sides **124**, **126** of the second shaft portion **121** extend along the second longitudinal adapter axis **120a** (i.e. extend along the x-axis in FIG. 1). In other words, the inner and outer sides are lateral sides of the second shaft portion **121** with respect to the second longitudinal adapter axis **120a** (i.e. along the x-axis in FIG. 1).

Further, the second shaft portion **121** of the second mounting part **120** has an upper end **125** and an opposite lower end **126**. The second hook portion **122** projects horizontally from the outer side **124** (i.e. extends along the y-axis in FIG. 1) at the lower end **126** of the second shaft portion **121**. In other words, the second hook portion **122** of the second mounting part **120** forms at the lower end **126** of the second shaft portion **121** a horizontal projection (i.e. extending along the y-axis in FIG. 1) with respect to the outer side **124** of the second shaft portion **121**.

At the upper ends **115**, **125** the first and second shaft portions **111**, **121** are configured to form, together, a support for flexibly mounting the object, when the first and second mounting parts **110**, **120** are inserted into the cavity **208**. In particular, the upper ends **115**, **125** of the first and second shaft portions **111**, **121** form a flat surface to support the stable mounting of objects thereon.

In general, the first and second mounting parts **110**, **120** are formed such that they, when inserted, engage with the cavity **208** of the seat rail **200**. This engagement of the first and second mounting parts **110**, **120** with the cavity **208** of the seat rail **200** characterizes the geometry and dimensions of the first and second mounting parts **110**, **120** as shall become apparent from the following.



Firstly, the first and second mounting parts **110**, **120** are configured such that, when inserted, the first hook portion **112** engages with the first cavity section **208a** while the second hook portion **122** engages with the second cavity section **208b**. In other words, the first and second hook portion **112**, **122** respectively project into the first and second cavity section **208a**, **208b** under the first and second upper flange portions **210**, **212** of the seat rail **200**.

Secondly, the first and second mounting parts **110**, **120** are configured such that, when inserted, the first shaft portion **111** and the second shaft portion **121** extend from the cavity **208** through the gap **214** to outside the seat rail **200**. The inner side **113** of the first shaft portion **111** lies opposite the inner side **123** of the second shaft portion **121**. Also at least parts of the outer side **114** of the first shaft portion **111** lies opposite the first upper flange portion **210** and at least parts of the outer side **124** of the second shaft portion **121** lies opposite the second upper flange portion **212** of the seat rail **200**.

Finally, the first and second mounting parts **110**, **120** are configured such that, when inserted, the first longitudinal adapter axis **110a** and the second longitudinal adapter axis **120a** are aligned with the rail longitudinal axis **201**. In other words, the first mounting part **110** and the second mounting part **120** of the seat rail adapter **100** extend, when in engagement with the cavity **208** of the seat rail adapter **200**, in parallel to each other and also are in parallel to the rail longitudinal axis **201**.

Accordingly, when the first and second mounting parts **110**, **120** are inserted into the cavity **208** of the seat rail, the first shaft portion **111** and the second shaft portion **121** extend in parallel through the gap **214** to the outside of the seat rail **200**. At the same time, when the first and second mounting parts **110**, **120** are inserted into the cavity **208**, the projecting first and second hook portions **112**, **122** both point in opposite directions.

Advantageously, the inner side **113** at the lower end **116** of the first shaft portion **111** of the first mounting part **110** and the inner side **123** at the lower end **126** of the second shaft portion **121** of the second mounting part **120** are rounded. However, not necessarily both of the inner sides **113**, **123** of the first and second shaft portions **111**, **121** need to be rounded at the lower end **116**, **126**, as apparent from the following.

The rounding at the lower ends **116**, **126** allows insertion of one of the first and second mounting parts **110**, **120** into the cavity **208** by a swivel movement, when the other one of the first and second mounting parts **110**, **120** is already inserted in the cavity **208**. Specifically, at least that one of the first and second mounting parts **110**, **120** which performs the swivel movement has at the lower end **116**, **120** the respective inner side **113**, **123** with the rounding.

For the at least one of the first and second mounting parts **110**, **120**, the rounding of the inner side **113**, **123** is arranged on an opposite lower end as the first and second hook portion **112**, **122**. Thus, the rounding of the inner side **113**, **123** of the respective first and second shaft portion **111**, **121** enables the first and second hook portion **112**, **122** to be inserted into and engage with the first and second cavity section **208a**, **208b** of the seat rail **200**, respectively.

In more detail, with the swivel movement the first and second mounting parts **110**, **120** are inserted through the gap **214** into the cavity **208**. At least one of the first and second mounting parts **110**, **120** performs a swivel movement around the first and second upper flange portion **210**, **212** of the seat rail **200**, respectively, to assume the (final) state in

which the first and second hook portions **112**, **122** engage with the respective first and second cavity section **208a**, **208b** of the cavity **208**.

Thereby, the first and second hook portion **112**, **122** are first inserted into the cavity **208** of the seat rail **200** through the gap **214** in between the first and second upper flange portions **210**, **212**, and thereafter at least parts of the first and second shaft portion **111**, **121** follow through the gap **214** into the cavity **208** such that the first and second hook portion **112**, **122** can engage with the first and second cavity portion of cavity **208** as described above.

Specifically, the first and second mounting parts **110**, **120**, particularly the rounding, are formed such that the swivel movement is enabled. In this respect, the first and second mounting parts **110**, **120** are formed such that the swivel axis for inserting one of the first and second mounting parts **110**, **120** into the cavity **208**, extends along a tip **117**, **127** of the hook portion **112**, **122** of the respective one of the first and second mounting parts **110**, **120**.

In other words, the swivel axis for inserting the at least one of the first and second mounting parts **110**, **120** extends along the respective first or second longitudinal adapter axis **110a**, **120a**, namely along the first or second hook portion **112**, **122** at the (outer) distal end thereof with respect to the rounding of the inner surface **113**, **123** of the first or second shaft portion **111**, **121**.

In summary, the first and the second hook portions **112**, **122** are configured to engage with the first and second cavity section **208a**, **208b** of cavity **208** of the seat rail **200**.

On the one hand, this configuration of the first and second hook portions **112**, **122** prevents the first and second mounting parts **110**, **120** from being removable with (only) a translational movement in the vertical direction (i.e. along the z-axis in FIG. 1). On the other hand, this configuration of the first and second hook portions **112**, **122** also prevents the first and second mounting parts **110**, **120** from being inserted with (only) the translational movement in the vertical direction (i.e. along the z-axis in FIG. 1).

Advantageously, the rounding of the inner side **113**, **123** of the first and second shaft portion **111**, **121** enables inserting one of the first and second mounting parts **110**, **120** with a swivel movement (i.e. with a rotation movement), when the other mounting part is already inserted in the cavity **208**. In other words, the rounding of the inner side **113**, **123** is configured according to the swivel movement that is required for the respective one of the first and second hook portion **112**, **122** to engage with the first or second cavity section **208a**, **208b**.

Consequently, the first and second hook portions **112**, **122** are configured to engage with the cavity **208** of the seat rail **200** in order to enable a stable mounting of objects on the seat rail adapter **100**. Thereby, when the first and second mounting parts **110**, **120** are in engagement, they are blocked from displacing along a vertical direction (i.e. along the z-axis in FIG. 1).

Notably, a distinction is made between inserting the first and second mounting parts **110**, **120** and the engagement thereof with the cavity **208**. These two terms differ in that one refers to a procedure and the other refers to a (final) position for the seat rail adapter **100** in the seat rail **200** as apparent from the following.

In the context of the invention, the term inserting/inserted shall be understood as the procedure according to which, at first, one of the first and second mounting parts **110**, **120** is inserted in the cavity, and then, the other one of the first and second mounting parts **110**, **120** is inserted by use of the swivel movement. Further in the context of the invention,



## 11

the term engagement/engaged shall be understood as a (final) state or position where each one of the first and second hook portions **112**, **122** of the first and second mounting parts **110**, **120** engages with the cavity **208**, hence, assumes a final position in the cavity **208** of the seat rail **200**.

Referring now to the illustrated seat rail adapter **100** in more detail, it can be readily appreciated that the first and the second shaft portion **111**, **121** of the first and second mounting parts **110**, **120** are formed such that, when inserted in the seat rail **200**, they abut on each other at the respective inner sides **113**, **123** thereof (cf. FIG. 2 under reference no. **134**). In other words, the inner side **113** of the first shaft portion **111** lies flat on the inner side **123** of the second shaft portion **121**.

Notably, also the rounding is provided on the inner side **113**, **123** of each of the first and second shaft portion **111**, **121**. Accordingly, the rounding may prevent that the first and second shaft portions **111**, **121** to abut at the whole inner sides **113**, **123** on each other. In this case, not the whole inner sides **113**, **123** but only a part of the inner sides **113**, **123** of the first and second shaft portions **111**, **121** abut on each other, preferably, the part which is outside of the seat rail **200**.

Further, it can be appreciated that the first and the second shaft portion **111**, **121** of the first and second mounting parts **110**, **120** are formed such that, when inserted in the seat rail **200**, the outer sides **114**, **124** of the first and second shaft portions **111**, **121** abut on the first and second upper flange portion **210**, **212** of the seat rail **200**. In other words, the outer sides **114**, **124** of the first and second shaft portions **111**, **121** lie flat on the first and second upper flange portions **210**, **212** of the seat rail **200**.

Consequently, the first and second shaft portions **111**, **121** are configured to abut on each other, and at the same time to abut on the first and second upper flange portions **210**, **212** within the gap **214** of the seat rail **200** in order to improve the stable mounting of objects on the seat rail adapter **100**. Thereby, when the first and second mounting parts are inserted in the cavity **208**, they are blocked from displacing along a lateral direction (i.e. along the y-axis in FIG. 1).

Referring now to the illustrated seat rail adapter **100** in further detail, it can be readily appreciated that the seat rail adapter **100** also comprises a fastening element **130** for fastening the first shaft portion **111** to the second shaft portion **121**, namely when the first and second mounting parts **110**, **120** are inserted into the cavity **208**. The fastening element **130** is one of a screw, a bolt, a nut or another element suitable for providing a releasable connection between the two mounting parts.

Consequently, the fastening element **130** enables fastening the first and second mounting parts **110**, **120**. Thereby, when the first and second mounting parts are inserted in the cavity **208**, they are blocked from displacing with a swivel movement, namely preventing the removal of the first and second mounting parts **110**, **120** from the seat rail **200**.

Referring now to the illustrated seat rail adapter **100** in even more detail, it can be readily appreciated that in addition to the first and second hook portions **112**, **122**, the first and second mounting parts **110**, **120** comprise a first and second structure **128** which engages with a first and second counter structure **216**, **218** on the first and second upper flange portions **210**, **212** of the seat rail **200**.

On the outer side **114** of the first shaft portion **111**, namely at a section above the first hook portion **112**, the first shaft portion **111** is provided with a first structure (not shown in FIG. 1) that is configured to engage a corresponding first counter structure **216** provided at a tip of the first upper

## 12

flange portion **210**. The first counter structure **216** is provided at the tip which points in the direction of the second upper flange portion **212** of the seat rail **200** (i.e. points towards the gap **214**).

Also, on the outer side **124** of the second shaft portion **121**, namely at a section above the second hook portion **122**, the second shaft portion **121** is provided with a second structure **128** that is configured to engage a corresponding second counter structure **218** provided at a tip of the second upper flange portion **212**. The second counter structure **218** is provided at the tip which points in the direction of the first upper flange portion **210** of the seat rail **200** (i.e. points towards the gap **214**).

In more detail, the first structure (not shown in FIG. 1) on the outer side **114** of the first shaft portion **111** is formed as a plurality of subsequent widenings and neckings alternating along the first longitudinal adapter axis **110a** (i.e. extending along the x-axis in FIG. 1). Particularly, the widenings of the first structure are formed as segments of a cylinder, whereas the neckings of the first structure are formed as flat surfaces. For the first structure, the distance between two consecutive widenings or between two consecutive neckings corresponds to the grid pitch **220**.

Further, the second structure **128** on the outer side **124** of the first shaft portion **121** is formed as a plurality of subsequent widenings and neckings alternating along the second longitudinal adapter axis **120a** (i.e. extending along the x-axis in FIG. 1). Particularly, the widenings of the second structure **128** are formed as segments of a cylinder, whereas the neckings of the second structure **128** are formed as flat surfaces. For the second structure, the distance between two consecutive widenings or between two consecutive neckings corresponds to the grid pitch **220**.

The first structure on the outer side **114** of the first shaft portion **111** is adapted to engage with the first counter structure **214** that is correspondingly formed as neckings and widenings alternating along the rail longitudinal axis **201** (i.e. extending along the x-axis in FIG. 1). Accordingly, for the first counter structure **214** the neckings are formed as segments of a cylinder, whereas the widenings are formed as flat sections.

The second structure **128** on the outer side **124** of the second shaft portion **121** is adapted to engage with the second counter structure **218** that is correspondingly formed as neckings and widenings alternating along the rail longitudinal axis **201** (i.e. extending along the x-axis in FIG. 1). Accordingly, for the second counter structure **218** the neckings are formed as segments of a cylinder, whereas the widenings are formed as flat sections.

In other words, the neckings of the first structure on the outer side **114** of the first shaft portion **111** and the widenings of the first counter structure **216** on the first upper flange portion **210** are formed as flat sections and are provided in-between (i.e. connecting) two adjacent segments of a cylinder, namely those which are formed by the widenings of the first structure on the outer side **124** and by the neckings of the first counter structure **216** on the first upper flange portion **210** of the seat rail **200**.

The neckings of the second structure on the outer side **124** of the second shaft portion **121** and the widenings of the second counter structure **218** on the second upper flange portion **212** are formed as flat sections and are provided in-between (i.e. connecting) two adjacent segments of a cylinder, namely those which are formed by the widenings of the second structure on the outer side **124** and by the neckings of the first counter structure **218** on the first upper flange portion **210** of the seat rail **200**.



## 13

Consequently, the first and second structures **128** on the first and second shaft portions **111**, **121** are configured to engage with first and second counter of the seat rail **200** in order to further improve the stable mounting of objects on the seat rail adapter **100**. Thereby, when the first and second mounting parts are in engagement, they are blocked from displacing along a longitudinal direction (i.e. along the x-axis in FIG. 1).

Referring now to the illustrated seat rail adapter **100** in even more detail, it can be readily appreciated that each of the first and second mounting parts respectively comprises a first and second overhang **119**, **129**. The first and second overhangs **119**, **129** project from the outer sides **114**, **124** at the upper ends **115**, **125** of the first and second shaft portions **111**, **121**, respectively.

The first and second overhangs **119**, **129** are configured to further enlarge, together with the upper ends **115**, **125** of the first and second shaft portions **111**, **121** the support for mounting the object, when the first and second mounting parts **110**, **120** are inserted into the cavity **208**. In particular, the first and second overhangs **119**, **129** are configured form together with the upper ends **115**, **125** of the first and second shaft portions **111**, **121** an enlarged flat surface to support the mounting of objects thereon.

The first and second overhangs **119**, **129** of the first and second mounting parts **110**, **120** enable a flexible mounting on the seat rail adapter **200** with an under grip. The first and second overhangs **119**, **129** are horizontally first and second overhangs which are overhanging the first and second shafts portion **111**, **121**, and are respectively facing in an outward direction. Thereby, objects can be slidably mounted on the flat surface when the first and second mounting parts **110**, **120** are inserted into the seat rail **200**.

Consequently, the overhangs **119**, **129** are configured to guide the sliding movement along the first and second longitudinal adapter axis **110a**, **120a** (i.e. along the x-axis) of the seat rail adapter **100**. Thereby, after sliding into position the object may be flexibly mounted in a position which is not restricted by a grid pitch **220** of the seat rail **200**.

Referring now to FIG. 2, a perspective view of a seat rail adapter according to the one embodiment of the invention is pictured along the cross section A-A (indicated in FIG. 1). The seat rail adapter comprises the first and second mounting parts **110**, **120** that are inserted in a seat rail **200**. FIGS. 3-11 illustrate a procedure of inserting the respective seat rail adapter of FIG. 2 in a seat rail, also with a view on the cross section A-A (indicated in FIG. 1).

The illustrated seat rail adapter of FIG. 2-11 is the same seat rail adapter **100** already described with respect to FIG. 1 such that the details thereof have been omitted for conciseness reasons. Moreover, these drawings help in understanding how the mounting parts **110**, **120** of the seat rail adapter **100** are inserted through the gap and engage with the cavity **208** of the seat rail **200**, thereby enabling the stable mounting of object onto the seat rail **200**.

Further to the procedure of inserting the first and second mounting part **110**, **120** in the seat rail **200** shown in FIGS. 3-11, where firstly the seat rail **200** is provided.

Then, a second mounting part **120** of the seat rail adapter **100** is inserted through the gap **214** into the cavity **208** of the seat rail **200**, such that the second hook portion **122** of the second mounting part **120** is engaged with the second cavity section **208b** of cavity **208** inside the seat rail **200**, and the second shaft portion **121** of the second mounting part **120** extends through the gap **214** to outside the seat rail **200**.

And finally, a first mounting part **110** of the seat rail adapter **100** is inserted through the gap **214** into the cavity

## 14

**208** of the seat rail **200**, such that the first hook portion **112** of the first mounting part **110** is engaged with the first cavity section **208a** of cavity **208** inside the seat rail **200**, and a first shaft portion **111** of the first mounting part **110** extends through the gap **214** to outside of the seat rail **200**.

From FIGS. 3-11 in can be readily appreciated that due to the rounding on the inner side **113** at the lower end **116** of the first shaft portion **111** of the first mounting part **110**, the insertion of the first mounting part **110** into the cavity **208** is enabled by a swivel movement, when the second mounting part **120** is already inserted in the cavity **208**.

Referring now to FIG. 11, another perspective view of a seat rail adapter according to the one embodiment of the invention is pictured along the cross section B-B (indicated in FIG. 1). The seat rail adapter comprises the first and second mounting parts **110**, **120** that are inserted in a seat rail **200**. FIGS. 12-19 illustrate a procedure of inserting the respective seat rail adapter of FIG. 11 in a seat rail, also with a view on the cross section B-B (indicated in FIG. 1).

The seat rail adapter illustrated in FIG. 11-19, is the same seat rail adapter **100** already described with respect to FIG. 1, such that the details thereof have been omitted for conciseness reasons. Moreover, these drawings also help in understanding how the mounting parts **110**, **120** of the seat rail adapter **100** are inserted through the gap and engage with the cavity **208** of the seat rail **200**, thereby enabling the stable mounting of object onto the seat rail **200**. Further to the procedure of inserting the first and second mounting part **110**, **120** in the seat rail **200** is shown in FIGS. 12-19.

Notably, the figures further detail the engagement of the first and second structure **118**, **128** in the respective first and second counter structures **216**, **218** on the first and second upper flange portions **210**, **212** of the seat rail **200**.

Finally, referring to FIG. 20 a reduced perspective view of a seat rail adapter according to another embodiment of the invention is shown for flexibly mounting an object to a seat rail. The illustrated seat rail adapter is the same seat rail adapter **100** already described with respect to FIG. 1, such that the details thereof have been omitted for conciseness reasons.

This figure further details the spacing between two adjacent fastening elements **130** of the first and second mounting parts **110**, **120** of the seat rail adapter **100**. As shown, fastening elements **130** are provided at a distance **132** which is five times the grid pitch **220**. Since the grid pitch **220** of a seat rail **200** is conventionally 2.54 cm (i.e. 1 inch), the distance **132** between the fastening elements **130** amounts to 12.7 cm (i.e. 5 inches).

The first and second mounting parts **110**, **120** of the seat rail adapter **100** can be provided along the entire length of the seat rail in the vehicle cabin, at least in a section where the flexibly mountable seats are being provided. In other words, not the entire length of the vehicle cabin but sections thereof may be provided with the first and second mounting parts **110**, **120** of the seat rail adapter **100** in order to allow, at least in this section, the seats to be adjustable without restrictions of the grid of the seat rail.

For this purpose, a plurality of the seat rail adapters **100** are arranged one after the other in the seat rail **200**, namely such that the seat rail adapters **100** continuously enable the mounting of the objects thereon. In other words, each one of the first and second mounting parts **110**, **120** of one of the seat rail adapters **100** contacts the respective preceding and succeeding mounting parts **110**, **120** of another of the seat rail adapters **100**, thereby preventing gaps in-between neighboring mounting parts **110**, **120**.



For continuously providing seat rail adapters in the seat rail **200**, the first and second mounting parts **110**, **120** of each seat rail adapter **100** have a length in the longitudinal direction (i.e. along the x-axis in FIG. **20**) of, for instance, 101.6 cm (i.e. 40 inches). Thereby, the first and second mounting parts **110**, **120** remain manageable and operable, and can manually be inserted into the inserted state in the seat rail **200**, as described before. At the same time, this length provides an additional amount of strength and structural stability, in that it may compensate manufacturing tolerances of the seat rail **200**. Notably, also different lengths of the mounting parts **110**, **120** of each seat rail adapters are possible, for instance, 152.4 cm (60 inches) or 203.2 cm (i.e. 80 inches).

Advantageously, in case of continuously provided seat rail adapters **100**, the inserted first and second mounting parts **110**, **120** may overlap in the first and second longitudinal adapter axis **110a**, **120a** (i.e. along the x-axis in FIG. **20**), in order to provide further strength and structural stability when mounting objects thereon. Thereby, the first and second mounting parts **110**, **120** of one seat rail adapter **100** do not only abut on each other in the sections **115**, **125** as described above, but also abut, due to the overlap, on the preceding or succeeding other mounting part **120**, **110**, respectively.

In more detail, on the inner side **113** of the first shaft portion **111**, the first mounting part **110** of seat rail adapter **100** abuts on the second mounting part **120** of the same seat rail adapter **100** and the preceding or subsequent second mounting part of a different seat rail adapter along the first longitudinal adapter axis **110a** (i.e. along the x-axis in FIG. **20**). At the same time, on the inner side **123** of the second shaft portion **121**, the second mounting part **120** of one seat rail adapter **100** abuts on the first mounting part **110** of the same seat rail adapter **100** and the subsequent or preceding first mounting part of a different seat rail adapter along the second longitudinal adapter axis **120a** (i.e. along the x-axis in FIG. **20**).

For this overlapped configuration of continuously provided seat rail adapters, the length of the mounting parts **110**, **120** of each seat rail adapter **100** is configured in correspondence with the distance **132** between two adjacent fastening elements **130** of the two mounting parts **110**, **120** of the seat rail adapter **100**. Particularly, the length of the mounting parts **110**, **120** is an integer multiple of the distance **132** between two adjacent fastening elements **130**. For instance, if the distance **132** amounts to 12.7 cm (i.e. 5 inches), then the length of the mounting parts are integer multiples of this 12.7 cm (i.e. multiples of 5 inches).

Thereby, it can be ensured that the fastening elements **130** equidistantly secure the mounting parts **110**, **120** in the overlapped configuration of continuously provided seat rail adapters onto each other, hence, allowing for same strength in mounting objects thereon.

The mounting parts **110**, **120** can also be manufactured in advance with corresponding holes, screw threads etc., for the fastening elements **130** to engage the secure connection there between. Accordingly, also in this advantageous configuration with the overlap, the mounting parts **110**, **120** of the seat rail adapter **100** may have a length in the first and second longitudinal adapter axis **110a**, **120a** (i.e. along the x-axis in FIG. **20**) of, for instance, 101.6 cm (i.e. 40 inches).

#### REFERENCE NUMERALS

**100** Seat rail adapter  
**110** first mounting part

**110a** first longitudinal adapter axis  
**111** first shaft portion  
**112** first hook portion  
**113** inner side  
**114** outer side  
**115** upper end  
**116** lower end  
**117** tip of the first hook portion  
**118** first structure  
**119** first overhang  
**120** second mounting part  
**120a** second longitudinal adapter axis  
**121** second shaft portion  
**122** second hook portion  
**123** inner side  
**124** outer side  
**125** upper end  
**126** lower end  
**127** tip of the second hook portion  
**128** second structure  
**129** second overhang  
**130** fastening element  
**132** distance  
**134** section of abutment  
**200** seat rail  
**201** rail longitudinal axis  
**202** lower flange portion  
**204** first web portion  
**206** second web portion  
**208** cavity  
**208a** first cavity section  
**208b** second cavity section  
**210** first upper flange portion  
**212** second upper flange portion  
**214** gap  
**216** first counter structure  
**218** second counter structure  
**220** grid pitch

While at least one exemplary embodiment of the present invention(s) is disclosed herein, it should be understood that modifications, substitutions and alternatives may be apparent to one of ordinary skill in the art and can be made without departing from the scope of this disclosure. This disclosure is intended to cover any adaptations or variations of the exemplary embodiment(s). In addition, in this disclosure, the terms "comprise" or "comprising" do not exclude other elements or steps, the terms "a" or "one" do not exclude a plural number, and the term "or" means either or both. Furthermore, characteristics or steps which have been described may also be used in combination with other characteristics or steps and in any order unless the disclosure or context suggests otherwise. This disclosure hereby incorporates by reference the complete disclosure of any patent or application from which it claims benefit or priority.

The invention claimed is:

1. A seat rail adapter for flexibly mounting an object onto a seat rail,

the seat rail extending along a rail longitudinal axis and having a U-shaped profile with a lower flange portion, a first web portion extending upwards from the lower flange portion, a second web portion extending upwards from the lower flange portion in a position spaced apart from the first web portion so as to form a cavity between the lower flange portion, the first web portion and the second web portion, with a first upper flange portion extending from the first web portion inwardly towards the second web portion so as to form



17

a first cavity section between the lower flange portion, the first web portion and the first upper flange portion, and with a second upper flange portion extending from the second web portion inwardly towards the first web portion so as to form a second cavity section between the lower flange portion, the second web portion and the second upper flange portion, wherein a gap is provided between the first upper flange portion and the second upper flange portion in order to allow access to the cavity from outside the seat rail,

the seat rail adapter comprising:

a first mounting part and a second mounting part, the first and second mounting parts configured to be inserted through the gap and to engage with the cavity of the seat rail,

wherein the first mounting part extends along a first longitudinal adapter axis and has a cross-profile comprising a first shaft portion and a first hook portion, wherein the first shaft portion has an inner side and an opposite outer side as well as an upper end and an opposite lower end, and wherein the first hook portion projects from the outer side at the lower end of the first shaft portion,

wherein the second mounting part extends along a second longitudinal adapter axis and has a cross-profile comprising a second shaft portion and a second hook portion, wherein the second shaft portion has an inner side and an opposite outer side as well as an upper end and an opposite lower end, and wherein the second hook portion projects from the outer side at the lower end of the second shaft portion,

wherein the first and second mounting parts are formed to engage with the cavity of the seat rail in such a manner that the first hook portion engages with the first cavity section while the second hook portion engages with the second cavity section,

that the first shaft portion and the second shaft portion extend from the cavity through the gap to outside the seat rail and the inner side of the first shaft portion lies opposite the inner side of the second shaft portion, and that the first longitudinal adapter axis and the second longitudinal adapter axis are aligned with the rail longitudinal axis, and

wherein the inner side at the lower end of the first shaft portion of the first mounting part or the inner side at the lower end of the second shaft portion of the second mounting part is rounded so as to allow insertion of one of the first and second mounting parts into the cavity by a swivel movement, when the other one of the first and second mounting parts is readily inserted in the cavity, and

wherein, when the first and second mounting parts are inserted into the cavity, the first shaft portion and the second shaft portion abut one another.

2. The seat rail adapter according to claim 1, wherein the first and second mounting parts are formed such that the swivel axis for inserting one of the first and second mounting parts into the cavity, when the other one of the first and second mounting parts is already inserted, extends along a tip of the hook portion of the one mounting part.

3. The seat rail adapter according to claim 1, wherein, when the first and second mounting parts are inserted into the cavity, the first shaft portion and the second shaft portion extend in parallel through the gap to the outside of the seat rail.

18

4. The seat rail adapter according to claim 1, wherein, when the first and second mounting parts are inserted into the cavity, the projecting first and second hook portions both point in opposite directions.

5. The seat rail adapter according to claim 1, further comprising a fastening element for fastening the first shaft portion to the second shaft portion, when the first and second mounting parts are inserted into the cavity.

6. The seat rail adapter according to claim 5, wherein the fastening element is one of a screw, a bolt, a nut or another element suitable for providing a releasable connection between the two mounting parts.

7. The seat rail adapter according to claim 1, wherein, when the first and second mounting parts are inserted into the cavity, the upper end of the first shaft portion and the upper end of the second shaft portion are configured to form, together, a support for flexibly mounting the object.

8. The seat rail adapter according to claim 1, wherein the first shaft portion at its outer side above the first hook portion is provided with a first structure configured to engage with a corresponding first counter structure provided at a tip of the first upper flange portion that points to the second upper flange portion of the seat rail, or wherein the second shaft portion at its outer side above the second hook portion is provided with a second structure configured to engage with a corresponding second counter structure provided at a tip of the second upper flange portion that points to the first upper flange portion of the seat rail.

9. The seat rail adapter according to claim 8, wherein the first structure is formed as a plurality of subsequent widenings and neckings alternating along the first longitudinal adapter axis, adapted to engage with the first counter structure formed as corresponding neckings and widenings alternating along the rail longitudinal axis, or wherein the second structure is formed as a plurality of subsequent widenings and neckings alternating along the second longitudinal adapter axis, adapted to engage with the second counter structure formed as corresponding neckings and widenings alternating along the rail longitudinal axis.

10. The seat rail adapter according to claim 9, wherein the widenings of the first structure and the neckings of the first counter structure are formed as segments of a cylinder, or wherein the widenings of the second structure and the neckings of the second counter structure are formed as segments of a cylinder.

11. The seat rail adapter according to claim 10, wherein the neckings of the first structure and the widenings of the first counter structure are formed as flat sections connecting two adjacent segments of a cylinder, or wherein the neckings of the second structure and the widenings of the second counter structure are formed as flat sections connecting two adjacent segments of a cylinder.

12. A seat rail arrangement comprising:

a seat rail extending along a rail longitudinal axis and having a U-shaped profile with a lower flange portion, a first web portion extending upwards from the lower flange portion, a second web portion extending upwards from the lower flange portion in a position spaced apart from the first web portion so as to form a cavity between the lower flange portion, the first web portion and the second web portion, with a first upper flange portion extending from the first web portion inwardly towards the second web portion so as to form a first cavity section between the lower flange portion, the first web portion and the first upper flange portion, and with a second upper flange portion extending from the second web portion inwardly towards the first web



19

portion so as to form a second cavity section between the lower flange portion, the second web portion and the second upper flange portion, wherein a gap is provided between the first upper flange portion and the second upper flange portion in order to allow access to the cavity from outside the seat rail; and

a seat rail adapter comprising:

a first mounting part and a second mounting part, the first and second mounting parts configured to be inserted through the gap and to engage with the cavity of the seat rail,

wherein the first mounting part extends along a first longitudinal adapter axis and has a cross-profile comprising a first shaft portion and a first hook portion, wherein the first shaft portion has an inner side and an opposite outer side as well as an upper end and an opposite lower end, and wherein the first hook portion projects from the outer side at the lower end of the first shaft portion,

wherein the second mounting part extends along a second longitudinal adapter axis and has a cross-profile comprising a second shaft portion and a second hook portion, wherein the second shaft portion has an inner side and an opposite outer side as well as an upper end and an opposite lower end, and wherein the second hook portion projects from the outer side at the lower end of the second shaft portion,

wherein the first and second mounting parts are formed to engage with the cavity of the seat rail in such a manner

that the first hook portion engages with the first cavity section while the second hook portion engages with the second cavity section,

that the first shaft portion and the second shaft portion extend from the cavity through the gap to outside the seat rail and the inner side of the first shaft portion lies opposite the inner side of the second shaft portion, and

that the first longitudinal adapter axis and the second longitudinal adapter axis are aligned with the rail longitudinal axis, and

wherein the inner side at the lower end of the first shaft portion of the first mounting part or the inner side at the lower end of the second shaft portion of the second mounting part is rounded so as to allow insertion of one of the first and second mounting parts into the cavity by a swivel movement, when the other one of the first and second mounting parts is readily inserted in the cavity.

**13.** A cabin arrangement comprising:

a seat rail extending along a rail longitudinal axis and having a U-shaped profile with a lower flange portion, a first web portion extending upwards from the lower flange portion, a second web portion extending upwards from the lower flange portion in a position spaced apart from the first web portion so as to form a cavity between the lower flange portion, the first web portion and the second web portion, with a first upper flange portion extending from the first web portion inwardly towards the second web portion so as to form

20

a first cavity section between the lower flange portion, the first web portion and the first upper flange portion, and with a second upper flange portion extending from the second web portion inwardly towards the first web portion so as to form a second cavity section between the lower flange portion, the second web portion and the second upper flange portion, wherein a gap is provided between the first upper flange portion and the second upper flange portion in order to allow access to the cavity from outside the seat rail;

an object; and

a seat rail adapter for flexibly mounting the object onto the cabin, wherein the seat rail adapter comprises:

a first mounting part and a second mounting part, the first and second mounting parts configured to be inserted through the gap and to engage with the cavity of the seat rail,

wherein the first mounting part extends along a first longitudinal adapter axis and has a cross-profile comprising a first shaft portion and a first hook portion, wherein the first shaft portion has an inner side and an opposite outer side as well as an upper end and an opposite lower end, and wherein the first hook portion projects from the outer side at the lower end of the first shaft portion,

wherein the second mounting part extends along a second longitudinal adapter axis and has a cross-profile comprising a second shaft portion and a second hook portion, wherein the second shaft portion has an inner side and an opposite outer side as well as an upper end and an opposite lower end, and wherein the second hook portion projects from the outer side at the lower end of the second shaft portion,

wherein the first and second mounting parts are formed to engage with the cavity of the seat rail in such a manner

that the first hook portion engages with the first cavity section while the second hook portion engages with the second cavity section,

that the first shaft portion and the second shaft portion extend from the cavity through the gap to outside the seat rail and the inner side of the first shaft portion lies opposite the inner side of the second shaft portion, and

that the first longitudinal adapter axis and the second longitudinal adapter axis are aligned with the rail longitudinal axis, and

wherein the inner side at the lower end of the first shaft portion of the first mounting part or the inner side at the lower end of the second shaft portion of the second mounting part is rounded so as to allow insertion of one of the first and second mounting parts into the cavity by a swivel movement, when the other one of the first and second mounting parts is readily inserted in the cavity.

**14.** The cabin arrangement according to claim **13**, wherein the object to be mounted is one of a seat, a structural element, or cargo.

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